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Electronic Trading of Agricultural Products

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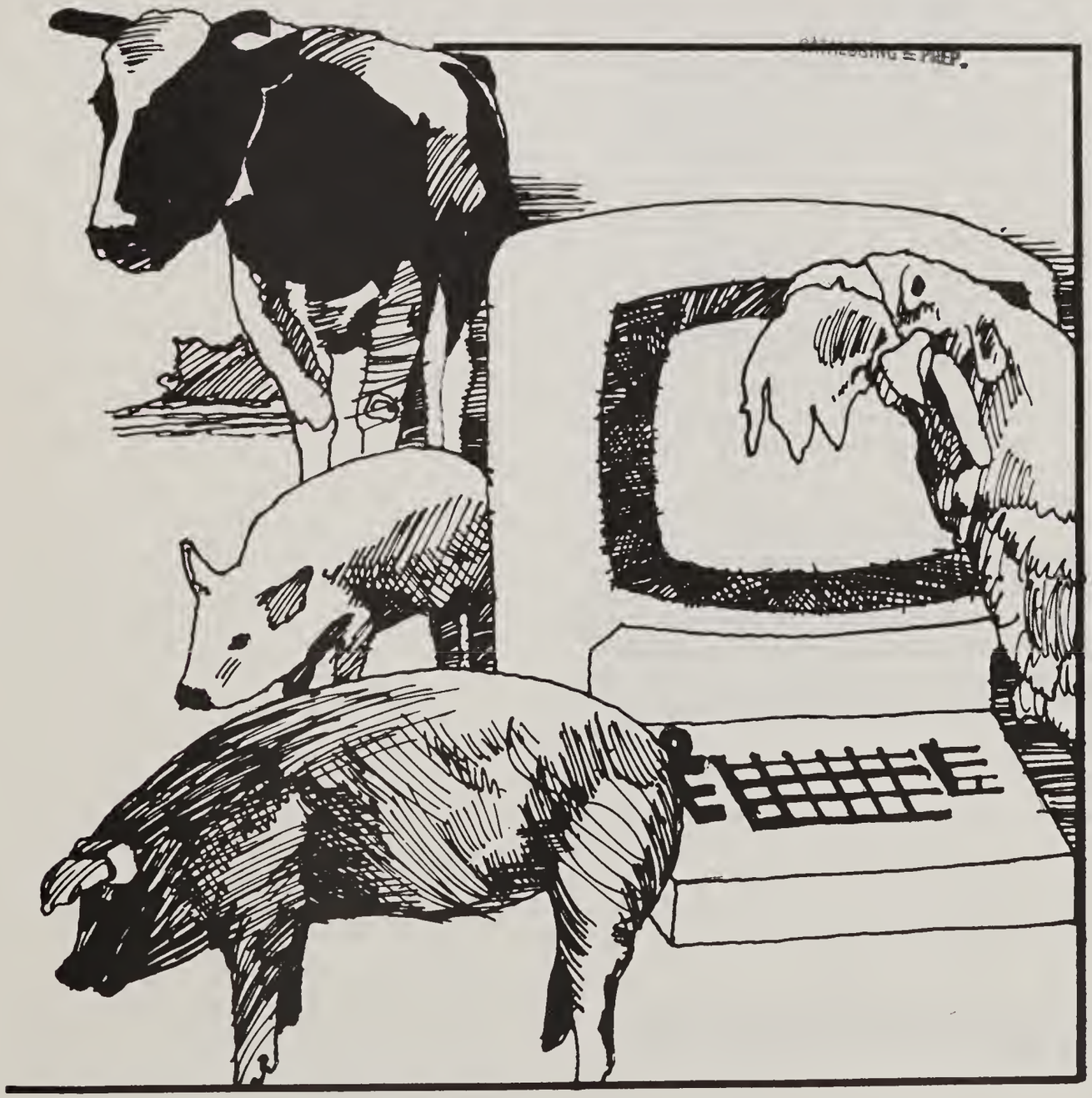

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Note:

Mention of brand names and corporations appear in this publication to identify examples of electronic marketing. This is not meant to imply any endorsement of products or firms by the U.S. Department of Agriculture.

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The Nature of Agricultural Markets

Introduction

In 1979, consumers spent more than $300 billion dollars for food, 16.4 percent of their disposable income. This amounted to about 13 percent of the Gross National Product. Approximately 68 cents of each consumer food dollar covers the costs of marketing. Labor is the largest single expenditure in the food marketing chain, equaling 31 cents. The remaining 37 cents pays the other food marketing costs including packaging, 8 cents; transportation, 5 cents; and profits to marketing firms, 5 cents.

Transforming raw farm commodities into consumer products involves assembly, processing, storage, transportation, and distribution. For statistical purposes these activities are commonly grouped into processing (manufacturing), wholesaling, and retailing. Wholesaling includes the assembly of raw products as well as wholesaling of manufactured products.

In the United States, the assembly, processing, and distribution of farm products are controlled by private decision makers responding to price signals in the marketplace and operating within a set of specified market institutions. These institutions include individual proprietorships, cooperatives, commodity exchanges, and other organizations. Supporting these institutions are the regulatory and service functions performed through the agencies of Government.

The various stages in the marketing chain must be coordinated if waste is to be avoided. This coordination occurs in two basic ways. If successive stages are owned by different firms, coordination is accomplished through explicit pricing in the market. The firms involved determine what and how much to produce, process, store, or transport, depending upon expected prices. Price signals and premiums or discounts are the medium which prompts change and adjustment. Coordination is achieved through exchange. Alternatively, if the successive stages are owned by the same firm, these decisions are made internally without explicit pricing. This is vertical integration through ownership. The marketing systems for most commodities are characterized by a mixture of vertical integration and exchange.

An exchange system must provide sellers and buyers convenient access to each other for the purpose of trading. It must enable the buyer to accurately gauge product quality. And it must provide assurances that the buyer will receive the product traded in good order, and that the seller will receive timely payment. Among the most common exchange systems in agriculture are administered pricing and private negotiation between individual sellers and buyers.

Administered pricing occurs when the seller or buyer posts a price and trades only at the posted price. This is the standard method for pricing food at wholesale and retail. It is also the standard method of pricing by first handlers in buying from farmers. Most purchases are made at the posted price, subject to premiums and discounts for nonstandard grades and moisture levels.

There may be some room for negotiation with the larger farmers. Administered pricing succeeds only if the firms involved have a substantial degree of market power.

Administered pricing avoids the costs of negotiating or haggling over small lots of a product. However, it does not necessarily determine the market clearing price in the shortrun. Some of the product may go unsold at the posted price or the merchant may run out of stock. Over a longer period, administered prices can be adjusted through a process of successive approximation until supply and demand are balanced and the market clears.

Beyond the farmer first handler level, many agricultural product sales are made by private negotiation over the telephone. Private negotiations facilitate efficient movement of farm products to assembly and processing points, since stopovers at auction yards or terminal markets are avoided. However, this method usually gives a small seller access to only a few buyers. The buyer and seller usually know each other and the buyer is able to bid on an unseen product because of the reputation of the seller. Trading terms -- including time and place of delivery, quality discounts, and premiums -- vary greatly.

Auction markets are still an important means of exchange for tobacco and some types of livestock, and terminal markets in major cities continue to play a role for fruit and vegetables. Futures markets provide pricing and hedging services for some of the major agricultural commodities, especially grain.

Because of economies of scale, facilities for marketing farm products tend to be larger in volume handled and fewer in number than the farms they serve. Consequently, relatively few facilities are accessible to each farm. Many communities have only one country elevator, one hog-buying station and one milk-processing plant. Farmers in the community would have to travel much farther to trade at other outlets. Thus, there is almost always an element of locational monopoly in agricultural marketing at the local level.

The marketing power of local farm product buyers is nevertheless limited. If the local merchant attempts to take too large a margin, farmers, particularly at the edge of the market area, would begin to deal with buyers at more distant locations. If the merchant's profits become even larger, additional competition will be attracted. Also, reference point prices established on futures markets can perform the important function of offering producers a guide to the value of their products or alternative selling opportunities.

Food manufacturing is becoming increasingly concentrated. Both the numbers of plants and numbers of firms engaged in most food manufacturing industries have declined in recent years. Among the most concentrated industries, measured in terms of percentage share accounted for by the four largest companies in 1972, are cereal breakfast foods (90 percent), cigarettes (84 percent), and chocolate and cocoa products (74 percent).

The food-retailing sector is also becoming more concentrated, particularly at the local level. Supermarkets (stores with over $1 million sales) account for 70 percent of all grocery store sales; corporate chains operate nearly two-thirds of all supermarkets.

The chains' share of grocery store sales rose from 34 percent to 57 percent between 1948 and 1972. Between 1954 and 1972 the percentage of markets (standard metropolitan statistical areas) where four firms accounted for half or more of all grocery store sales increased from 30 to 55 percent.

Problems in Agricultural Marketing

Although the agricultural marketing system performs an outstanding job in converting raw farm products into food and fiber products ready for consumer use, it is not without its problems. Two of the most serious problems are inefficiency and imperfect competition.

In an efficient marketing system, where waste is absent, each resource is used where it results in the greatest benefit to society and no marketing function could be performed equally well with fewer resources. Inefficiencies in agricultural marketing firms include the use of technologically obsolete equipment and facilities; processing plants which are too small to achieve economies of scale; moving products to market by indirect routes or other than least cost modes of transportation.

Efficiency is an ideal which is approached, but never fully attained. The optimal marketing system changes with changes in tastes, advances in technology, and depletion of natural resources. The system that is most efficient today is not likely to be most efficient a decade from now.

Concern about the competitiveness of agricultural markets is directly related to the decline in large organized central markets and the increase in decentralized trading where each farmer's products are exposed to only one or a few buyers. This often leaves the organized market as a residual market, used primarily for product of low quality, distress transactions, or by producers with small or odd-sized lots.

The decline of organized markets also reduces the access to buyers of small producers or producers who may be geographically isolated. Buyers will prefer to deal with sellers closest to product delivery points and with larger sellers to reduce total time and cost of the transactions. This may result in substantial increases in marketing and transportation costs for these smaller dispersed producers, since dealers may be required to assemble larger, more economical lots.

For a number of agricultural commodities, increased formula trading has resulted in "thin markets." Meat and eggs are prime examples. While there is some disagreement as to the definition of thin markets and their economic consequences, thin markets commonly display a relatively small number of negotiated price transactions per unit of time. With few potential buyers and sellers standing by at any time, it becomes difficult to sell without driving the price down, or to buy without raising the price. Consequently, prices on thin markets are often erratic. These prices do not necessarily represent the true value of the product. And, such prices may be subject to manipulation as individual traders discover that they can affect the market price by their offers to buy or sell.

Thin markets and formula trading tend to feed upon each other. As buyers and sellers step out of the negotiating arena to obtain the shortrun efficiencies inherent in formula pricing, the market becomes thinner. As the market

becomes thinner, negotiating trades becomes more difficult, and formula pricing becomes more attractive. Eventually, negotiated trading can virtually disappear.

Under these conditions, it becomes difficult to maintain a viable and competitive market for the product. Readily available market information from centralized markets may not be reliable. And, collection of useful price information on formula trades or direct negotiations is very difficult due to the large number of trades taking place under a variety of circumstances and terms.

The lack of accurate public price information may give the larger trader some competitive advantages over smaller traders. In agriculture, the structural imbalance between buyers and producers affords the buyers more accurate price information. This environment also increases the potential for price manipulation through selective or inaccurate reporting or release of information concerning the terms of private transactions.

Electronic Trading

Background

One means of addressing the problems of inefficiency and imperfect competition is electronic trading. Electronic markets separate two distinct but often combined marketing functions: (1) negotiating the trade, and (2) the physical transfer of the product from seller to buyer. Through the use of modern electronic technology, the former can be centralized while allowing the latter to remain decentralized. Centralizing the price discovery process helps create the highly competitive market environment among a large number of buyers and sellers necessary for a high degree of pricing accuracy. Decentralizing the physical exchange of the commodity can eliminate much of the costly and inefficient process of assembling buyers, sellers, and products at a single exchange point. Prices should more accurately reflect overall market-wide conditions, access to markets should be enhanced, market information would be more accurate and more readily available, and total marketing costs could be reduced.

Critical elements in the success of electronic trading are the ability to satisfactorily describe to buyers the product traded and the ability to guarantee that both buyer and seller honor the sales agreement. Grades should adequately describe the product so that visual inspection by the buyer is not necessary, and the standards should be sufficiently flexible to describe a wide variation in product quality or differentiation. Descriptive selling is not new and adequate grades and standards facilitating it exist or can be devised for most agricultural products. Performance guarantees can be provided through contracts backed up as necessary by buyer/seller bonding or by an exchange organization which sets standards for membership and guarantees members' obligations.

Methods of Trading

All the variations of electronic marketing follow the same general model. Sellers describe their commodities consistent with standard grades. Third party inspectors can be used, if traders prefer. Grading can occur at the seller's farm or plant or at a local assembly point, depending on the size of the lot. Similar products from different sellers can be commingled into truckload or carload lots prior to being offered for sale, or commingling can be

done "on paper" with actual assembly after the sale.

Offers to sell are disseminated to potential buyers at remote locations through two-way telecommunications. Offers to sell can be made with the price to be determined by auction or they can be made at firm prices. After a sale is negotiated, shipping arrangements are made, either directly to the buyer or through an assembly point.

One form of remote trading, which has been used widely in the United States in recent years, is the conference telephone auction, known as the teleauction. This system is currently used in several States for marketing feeder pigs. Prior to the auction, sellers list their offerings with the auction manager. At the specified time, potential buyers establish voice communication with the manager through a conference telephone connection. Each lot is then offered in turn to all buyers simultaneously, and sold to the highest bidder.

The teletype auction is similar to the teleauction except that seller consignments are listed on teletype printers located in buyers' offices. Buyers then use the teletype keyboard to make bids during the auction. This system has been operated successfully for many years to sell slaughter hogs in Ontario, Canada.

The potentials for electronic trading are greatly enhanced by using computers to process, store, retrieve, and transmit market information, offers to sell, bids, and trade confirmations. A network of computer terminals can be linked through a central computer. Numerous buyers and sellers can thereby be brought into simultaneous contact with each other through an interactive system of remote terminals, each with an input keyboard and a printout device to receive information. Terminals can also have cathode ray tubes (CRT's), television-like screens on which information can be displayed and reviewed more rapidly. Remote access computer terminals enable data to be transmitted more rapidly and more accurately than voice transmission on the telephone.

Electronic trading has the potential for expanding the marketplace for a seller and for providing more product sources for a buyer. It speeds up the marketing process by allowing sellers to contact potential buyers simultaneously rather than sequentially. An electronic marketing system also makes it possible for potential buyers to contact a number of sellers at one time.

Advantages to Agriculture

The principal advantage of electronic trading is the potential gain in pricing efficiency to markets characterized by many dispersed sellers and buyers, and by the exchange of large volumes of price and quantity data. The advantages are most apparent where there are many small dispersed sellers, few buyers, and no readily available organized market for the product. By expanding the geographic bounds of the marketplace, barriers to a competitively determined price are reduced. Sellers offer their product to more buyers, and buyers have more alternative sources of supply. Because the market is expanded, the market price is a more accurate indicator of the interaction of supply and demand forces. Price is less likely to be affected by the unequal bargaining strength of different traders. The allocative efficiency of

the market price is improved and resources are used more effectively.

For wholesale products, electronic markets can provide better coordination of the flows of various products to their highest order of use. With traditional selling methods, smaller firms tend to depend upon repeat customers with whom they deal week after week. They often become captive suppliers, vulnerable to the market power of large volume buyers. With electronic trading, they have instant access to alternative outlets when their traditional buyers offer less favorable terms.

Electronic markets also offer the potential for improved operational efficiency. Operational benefits stem from the improved pricing accuracy, market information, and market coordination. Moreover, several operational advantages flow from particular features of electronic methods of selling:

1. Buyers and sellers eliminate the costs associated with traveling to farms and markets in order to trade.

2. Transportation efficiencies can be achieved by elimination of the need for central assembly of products prior to sale, and by more direct matching of buyers and sellers, which helps to eliminate cross hauling. Savings are both in lower handling and transportation costs, and in reduced product loss, damage, and shrinkage.

3. Market price information is easily compiled because trading occurs through one common mechanism. Because the computer incorporates a system of two-way communications between traders and the exchange itself, that same communications system can be used to disseminate market information, an essential part of the exchange process. This information would be available to commodity analysts for use in supply and demand analysis.

4. Sellers have more flexibility in timing their sales. Buyers can time purchases and deliveries to correspond with their input needs.

5. Buyers can more easily select specific types of products and can more easily optimize the mix of product quality.

6. Electronic trading systems can reduce communications to one or two contacts and the time required for a transaction to just a few minutes, depending upon the system of bidding.

7. Where computers are used as the central mechanism for trading, numerous auxiliary services can be offered to buyers and sellers at relatively low cost: farm management services, accounting for buyers and sellers, documentation of transactions, relaying individual messages, automatic aggregation and handling of invoices and payments, arrangement of transportation, commodity news services, and weather information. The possible uses of the computer to facilitate the marketing process is limited only by the imagination of its designers.

The cost of marketing on an electronic system will depend upon the complexity of the system and the volume of trade. Although a computerized system is fairly expensive to develop and install, the marginal cost of selling more units is very small. A high-volume system will have per-unit

costs lower than traditional auction systems.

Sixty years ago, increased availability and lowered cost of voice communication by telephone and radio enabled more direct selling and more efficient physical movement of product from farmer to processor. In the future, the lowered costs of computerized communication will encourage remote access selling. The cost of communicating computerized information has fallen dramatically relative to the cost of voice communication. There is little reason to believe that we have reached the end of these changing relationships.

Examples of Working Systems

It is important to distinguish between the three types of computerized systems that are currently being used. One system provides information, but no trading occurs. The second system exchanges products at administered prices. The third exchanges products by negotiated trading. This section will concentrate on systems facilitating negotiated trades.

Computerized Information Systems

A number of computerized systems are now being used to provide traders with valuable information about potential transactions, but do not enable traders to execute transactions. An example is the airline reservation system which uses computers to keep an inventory of seats on scheduled airlines. The system can be accessed directly via a number of remote terminals, or indirectly by telephone to a terminal operator for an instant update of seat availability. The system reserves each entrant a seat by class and records the passenger's name and phone number. Without the aid of computers, the task of keeping reservations, making changes, and writing tickets would be slow and burdensome for the 205 million revenue passengers enplaned on domestic airlines each year.

The AutEx Division of Xerox Corporation provides an information system for traders of large blocks of corporate securities. The system provides broker-dealers and financial institutions with information about specific blocks of stock available for sale or desired for purchase. Based on information exchanged over the AutEx system, transactions are executed on a stock exchange floor. AutEx has a large potential market. In 1970, almost 70 percent of the dollar volume in securities' markets was generated by financial institutions. Financial institutions subscribing to the service include banks, insurance companies; and state, mutual, private, and corporate pension fund managers.

AutEx has also developed the Floral Market Network, an information system for cut flowers, foliage plants, and potted plants. The system, which has received the support of the Society of American Florists, will carry four major types of information: (1) information about products for sale; (2) information about products sought by buyers; (3) bulletins or general information; and (4) direct or confidential information between two parties. The potential benefits of the Floral Market Network include the more rapid turnover of perishable inventories and reduced advertising costs.

Reuters Ltd., a worldwide commercial news wire service, provides computerized information systems for traders of foreign currencies, gold, and other nonferrous metals. The systems enable subscribers to "advertise" individual bids and offers to other traders throughout the world. Actual trades are completed off the system. Any interested party can subscribe to these services.

Computerized Exchange at Administered Prices

Systems are now being developed that will enable firms to purchase products electronically from vendors. The products are traded at the vendor's administered prices. These systems do not involve price negotiation or competitive bidding.

General Electric, May Co., and Haggar Slacks are currently testing a pilot electronic purchasing system. Since May Co. and Haggar have different means of identifying the same product, the system translates May's purchase order and identification codes into a standard format. When Haggar receives the order, it is translated into Haggar's format and codes. Only a sample of May Co. stores is participating in the project. The results to date have been positive. Future plans include the addition of invoice processing and order acknowledgement on the system.

Computerized Trading Systems

Currently, computerized electronic markets are operational for cotton in the major cotton areas of Texas and Oklahoma, and for eggs on a nationwide network. Pilot electronic trading projects are currently being tested for slaughter hogs in Ohio, for slaughter cows and lambs in Virginia, feeder pigs in Virginia and North Carolina, and for feeder cattle in Texas. A nationwide electronic trading system for wholesale meat has been developed and is ready for testing. And, a multicommodity electronic marketing feasibility study is being conducted at the University of Georgia Experiment Station. All of the above projects, with the exception of the cotton system, TELCOT, have received partial funding from the U.S. Department of Agriculture (USDA).

1. TELCOT

The cotton electronic marketing system, TELCOT, was developed by the Plains Cotton Cooperative Association (PCCA) in 1975. Buying terminals were installed in 15 merchant offices in Lubbock and Dallas, Texas, and Memphis, Tennessee. The terminals were leased to buyers at cost. Cotton was offered one lot at a time with full description of class, quantity, and location. Buyers were allowed to enter blind bids (they were not shown other buyers' bids). After 15 minutes, the lot was sold to the highest bidder. Approximately 230,000 bales were traded in the first year.

In 1976, the buyer network was increased to 25. Terminals were also installed in 15 gins, the most important single step toward grower acceptance of TELCOT. About 380,000 bales were handled through the system in 1976.

In 1977, when 840,000 bales were handled, the buyer network was enlarged to 30 offices, and 75 gins had terminals. The firm-offer system was added, allowing the producer to specify a price and keep the cotton available to buyers until purchased or withdrawn. The blind-bid system was continued, but

the firm offer became the most popular method of sale, providing buyers an opportunity to purchase large volumes in a short period of time.

In the 1979-80 season, there were 40 buyer terminals which were used by 51 buyers. Nearly 270 gin offices, cooperative and independent, had terminals. Volume in 1979-80 was more than 1.7 million bales, about 11 percent of the U.S. cotton crop. With the beginning of the 1980-81 season, there are 55 buyer terminals and 350 seller terminals.

Presently, the buyer pays a monthly charge for the remote terminal and telephone line. Operating costs are also paid by the buyer through a commission fee on each bale of cotton purchased through the system. Part of this fee is retained by PCCA for TELCOT expenses. The remainder is sent to the participating gins to help cover their expenses, including terminal rental.

TELCOT provides buyers with the USDA classification data on all cotton sold on the system. The data consists of quality determinations for fineness, length, and grade.

PCCA serves only cooperative gins in the Southwest. In 1978, a new firm, Commodity Exchange Services (CXS) was organized to extend electronic marketing to noncooperative gins in the area. PCCA and CXS have used the same computer, buying terminals, and telephone lines to lower the cost per bale.

By the fall of 1980, 75 to 80 percent of the gins in northwestern Texas and southwestern Oklahoma were participating in the system. In 1981, the effort to sign up new gins will concentrate on the Blacklands, Coastal Plains, and Rio Grande Valley areas.

High trading volume is very important to the TELCOT system, as fixed expenses are quite high, while variable costs are extremely low. To further spread the fixed costs, additional systems have been or will be added such as gin accounting, farm accounting, cotton warehouse accounting, word processing, electronic mail, and home terminals for cotton producers. Eventually, TELCOT will evolve into a multifunction, multicommodity system to benefit agriculture.

TELCOT has succeeded because it has met the producer's and gin's need for more flexibility in marketing and the buyer's need for both better description of cotton and for the means to purchase large volumes of product more rapidly.

2. ECI

The Egg Clearinghouse, Inc. (ECI) was established by egg producers in 1971 to facilitate competitive price discovery. Initially, trading was a manual operation with buyers and sellers telephoning offers and bids to the clearinghouse. After calculating adjustments for freight, ECI matched trades between members. The trading of gradeable nest-run eggs proved the most successful.

ECI began using a computer to trade nest-run eggs in 1977, primarily to assist in the complex freight adjustments. During the first 6 months of the project, five terminals were placed with traders each month. Beginning December 1978, terminals were rotated to new cooperators, exposing 60 traders to electronic marketing in 18 months. Today, there are 55 terminals in operation among buyers and sellers.

Only 3 of 20 firms who had been using a terminal on a trial basis returned it, and 2 of these are no longer in the egg business.

Trading volumes on the ECI network increased from about 100,000 cases in 1972 to almost a million cases in 1977. While volume dropped in 1978, trading was restored to near peak levels in the last quarter of 1979. Volume traded in 1980 should fall just short of the 1977 peak. Total trading on the ECI represents about one-half percent of all eggs produced, probably about 5 percent of the nest-run sales.

There are two trading sessions per day when members can enter bids and offers. Each session is divided into four periods. Actual placements of bids and offers via terminals are not very numerous. Typically, during recent months, there have been 40 to 80 bids and offers placed per month via terminals out of a total of over 2,000 bids and offers made on the ECI network. Traders tend to use the system to discover their best alternatives, then they phone operators at ECI to actually trade. Buyers and sellers often circumvent ECI to make trades, and they do not provide ECI with information about these trades. This may suggest some modification of the system.

Only ECI members may trade, but membership is open to anyone in the egg business. Members pay a monthly fee and brokerage fees on completed trades. ECI guarantees performance on both sides of the contract and handles payment.

3. HAMS

The Ohio Department of Agriculture (ODA), Ohio State University and the Ohio Producers Livestock Association (PLA) have initiated electronic marketing of slaughter hogs in the United States through their Hog Accelerated Marketing System (HAMS). ODA and PLA invited packers, buyers, order buyers, farmers, dealers, educators, and others interested in hog trading to join with them to develop the trading rules and policies for the system.

HAMS allows hogs to be sold through both an auction system and a firm-offer system. Selling terminals are located at 9 farms or farm locations and at 17 Producers Livestock Association yards. Buying terminals are located at 19 packing plants. Initial software and hardware problems have been solved. Sales in late 1980 ranged between 1,200 and 2,200 head per day. There remain human marketing problems, notably the resistance to change.

Product descriptions are based on proven methods of live grading refined from current USDA grades. Grades are designated USDA 1+, USDA 1 average, USDA 1-, USDA 2+, and the USDA 2-, based on fat thickness and degree of muscling. Additionally, buyers are told weight, category, hair color, the number of hogs, and their location. One-owner lots are identified by owner. The Producers Livestock Association is responsible for grading.

If a farmer has a minimum of 50 hogs in a lot, they may be sold on a firm-offer basis. However, lots of less than 50 will be commingled at the yards for sale by auction. Farmers with 100 or more hogs may sell free on board (f.o.b.) at the farm.

All hogs sold through yards will go by the auction method. Initially, both ascending and descending auctions will be tested in order to

select the better method. The descending auction will run daily from 9 to 11 a.m., followed by the ascending auction. PLA will guarantee payment, with the farmer paying the cost of handling -- $1.20 per head for on-farm hogs, and $1.60 for off-farm hogs.

The system may have the advantage of reducing packer acquisition cost by allowing purchases from the office. Losses from shrinkage and death may be minimized because hogs will stay longer on the farm. Operating costs for packers may decrease as they gain greater control over the hog delivery schedule.

The system is available to all hog sellers in Ohio. Packers in Ohio, Pennsylvania, Virginia, Michigan, New York, Maryland, and Tennessee have agreed to purchase hogs on the system. The communication and computer costs will be about 30 cents per head if two million hogs are sold on the system annually.

4. EEMA

The Virginia State Department of Agriculture and Virginia Tech developed an electronic marketing project for slaughter lambs and cows, which is now being adapted to feeder pigs.

The Eastern Electronic Marketing Association (EEMA) was organized on a nonprofit basis in 1980 to administer the electronic trading system and to work with potential traders in developing a usable system. The board of EEMA is comprised of producers and other marketing agencies that use the system.

The EEMA computer-based auction system allows farmers to sell animals on the farm or at local assembly areas. Currently, 21 buyer terminals are in place, 8 for lamb buyers and 9 for cattle buyers. Animals may be sold on a live-weight and grade basis or on a carcass weight and yield basis.

The first step for the potential seller is to go to the local assembly point and provide EEMA with descriptive information about the animals including location, number of head, grades (determined by a State grader), estimated dressing percentage, and breed. This information is entered into the computer from a remote terminal located at the assembly area. Prior to the auction, potential buyers can use the terminal to view the day's listings and call on the computer for further descriptive statistics on individual offerings.

At a scheduled time, the computer starts the auction. To bid, buyers simply press a key on their terminals and the bid increases by a specific increment. The terminal advises the buyer whose bid is the highest, and all buyers are given the current bid. Bidding continues until no further bids occur in a set time period. After bidding stops, the sale is confirmed unless the high bid is less than the "no sale" price earlier specified by the seller.

On May 16, 1980, the first lamb sale by computer auction was held. The sale was a great success, selling 755 lambs in 2 lots. The lambs remained on the farms of about 38 producers in 8 counties in Virginia and 1 in North Carolina, while the sale was being conducted. They were assembled at three locations, within a week after the sale, at the buyer's convenience.

A sale has been held each week for producers in Kentucky, West Virginia, North Carolina, Tennessee, and Virginia selling to packers in Detroit, Michigan; Rochester, New York; Baltimore, Maryland; Philadelphia, Pennsylvania; Toronto, and Kitchener, Ontario. Sales have continued to average 750 head per week.

A system for the computerized auction of slaughter cows has also been developed, but is not presently functioning.

Computerized trading of feeder pigs is expected to begin in January 1981. EEMA will market the relatively small number of Virginia feeder pigs first. North Carolina has also expressed interest in trading feeder pigs on the EEMA. The potential volume for the feeder pig system, given the relative ease of substituting the computer based auction for the now existing teleauctions, is more than one million head annually.

5. CATTLEX

Texas A&M University and the Texas State Department of Agriculture entered into an agreement to set up and test a pilot project for the electronic marketing of feeder cattle in Texas over a 2-1/2 year period between 1980 and 1982. The project allows for a development stage, a demonstration stage which began in September 1980, and an evaluation stage expected to commence in mid-1981.

CATTLEX (Cattle Exchange) was designed as a centralized remote access cash market for feeder cattle. Development of computer software systems, operation procedures, and trading techniques is now completed. Trading is being confined initially to 17 terminals, all located in Texas. The first live auction was held September 3, 1980, and the first lot sold September 4. Though the number of listings ranges between 700 and 2,000 head per week, there has been a high percentage of no sales. Cattle have been offered at a reservation price which is higher than the bid price although the bid price has been consistent with the market price. Whether this is a short-term phenomenon due to the very high price of feed grains or attributable to more pervasive factors, has not yet been determined.

Descriptions of lots of 20 head of cattle or more are entered into the central computer from a remote access terminal. A general description of the lot includes the number of head, sex, estimated weight, primary grade, location, delivery date, breed, age, and flesh condition. In addition to the general description of the lot, a third party grader provides a more specific breakdown of the individual animals within the lot.

The descriptions of all lots to be offered are available to buyers by 9 a.m. The auction operates from 10:30 a.m. through 2 p.m. each business day. Lots are listed by a random lot number and a sale number which indicates the sequence in the auction.

Buyers first view a summary listing of the day's offering on the remote access CRT. If a buyer is interested in a specific lot, the terminal can be used to call for a summary description of that lot which will provide some additional detail on grade, location, and age, along with "soft" information such as comments by the grader and/or the owner concerning the lot.

During the auction period, the CRT screen displays listings of eight lots currently being auctioned along with the eight lots most recently sold, and the price they brought. Each lot is available for progressive bidding for 16 minutes. A new lot begins the auction and one lot is sold to the highest bidder every 2 minutes.

Buyers are certified before the auction begins. Partial payment of $30 to $40 per head is required on sale day and final payment due upon delivery. The Texas Livestock Marketing Association is a bonded producer cooperative, which oversees the transfer of funds between buyers and sellers. Any disputes between traders regarding description of cattle are settled by the parties involved in the transaction, so the computerized system still relies on reputation trading to some degree.

6. CATS

With the decline in centralized markets for wholesale meat in the United States, there has been public concern about the price discovery process for wholesale meat, especially beef. In 1977, President Carter requested an investigation of beef pricing and price reporting to identify problems involved. This investigation revealed that a relatively small proportion of total beef carcass carlot sales involved negotiated prices, and that this thin market of negotiated trades formed the basis for widespread formula trading.

An electronic market for wholesale meat was suggested as one possible alternative to broaden the base of negotiated prices in order to improve the efficiency of the wholesale meat marketing system, to reduce the potential for market manipulation, and to provide an improved source of market news information about trade in wholesale beef.

The American Meat Exchange (AME) is a private company set up specifically to develop and test a national electronic marketing system for wholesale beef. AME, in conjunction with the General Electric Information Services Company, has developed a computer assisted trading system (CATS) which is designed to be a trading system first, but also a meat price reporting system. The Illinois Department of Agriculture is cooperating with the University of Illinois to oversee the testing and evaluation of CATS.

A central computer will link remote access terminals (CRT's and printers) in the CATS system. The computer will list bids and offers and report completed sales. Actual trading will be accomplished by individual traders working with remote terminals through the central computer.

Trading will be divided into ten regions of the United States. The ten regions will operate simultaneously and independently, but can be accessed from any other region. The system will also allow for trading in different time frames. In the spot market, deliveries are to be made within 5 days. The intermediate market will be for deliveries from 6 to 10 days ahead. Future delivery will be for more than 10 days ahead. The product will be identified according to a meat buying guide numbering system which is currently used by the industry in boxed beef trading.

Buyers and sellers will begin negotiations by entering relevant information on the system through the remote terminal. The required information will include the regional market, time frame desired, product number description, quantity, delivery date, price, and general trader identification number or

company. The computer will assist the buyer/seller by listing all potential offers/bids in the system with the specifications requested by the trader.

If participants see a potential trade listed on the screen, they will enter into the private negotiations mode where the trading activity will be displayed only on the two individual screens. Buyers and sellers can then negotiate for final terms of trade -- premiums and discounts, special time specifications, special loading/unloading requirements -- and final price. Only the final volume, final price, and terms of trade will then become public.

CATS will generate information on the highest and lowest volume traded through the last sale, and the weighted average price. It will run 24 hours a day, starting at 4 p.m. The potential universe to use the system is estimated to be up to 300 companies who would trade, with an additional several thousand organizations who would use CATS for market information only.

Installation of terminals will be made and operations will commence as soon as enough representative buyers and sellers have agreed to join the system on a test basis. The goal is to include every major supplier and buyer. The system could operate if 15 to 20 large companies would participate. About half of the necessary companies have indicated a desire to trade on the system.

There will be an initiation fee ranging from $10,000 for a company with $2 billion in sales to $500 for a company with $1 million in sales to help cover equipment, computer time, and trader training costs. USDA has provided funds to help offset participants' costs in this initial test. Terminals will rent for approximately $300 a month. Time charges will be from $25 to $50 a trading hour. CATS is estimated to cost a larger trader about $30,000 a year.

In addition to the high fee schedule, a major problem delaying the operation of CATS is the reluctance of some large meat packers to test the system. Some companies assert doubts about the ability of CATS to adequately describe product quality. They say the system is not sufficiently flexible to consider nonprice factors of trade such as reputation of the trader, credit risks, and nonstandard operating procedures. Also, most traders are not totally dissatisfied with the current system of marketing beef through individual telephone contact. Proponents say that CATS is an opportunity to expand their marketing power at relatively low cost. These supporters say that CATS will not force companies to trade with anyone they do not wish to because CATS is not a blind matching of buyer and seller -- traders have ultimate control over the selection of their trading partners.

7. Toronto Stock Exchange

The Toronto Stock Exchange operates an electronic system for relatively inactive stocks in which two arrayed columns are shown for each stock issue. The bid column shows the number of shares desired and the bid prices. The offer column shows the number of shares offered and the asking price. In this system, the machine simply displays bid and offer prices. Bids are arrayed with the highest bid on the top. Offers are arrayed with the lowest offer on

top. Both bids and offers are commitments as long as they are displayed, but can be withdrawn or changed at any time. The action takes place at the top of the two columns. The actors are the participating brokers. If bidding brokers see a suitable offer close to their price, they press the appropriate keys to accept the offer.

8. Intermarket Trading System (ITS)

The 1975 amendments to the Securities and Exchange Commission Act required that the securities industry move toward a national market for corporate stocks. Such a market is needed to increase competition among stock exchanges and to assure a buyer or seller of getting the best price available in the United States.

The Intermarket Trading System (ITS) was introduced April 17, 1978, linking the trading floors of the New York and Philadelphia stock exchanges. By August 1978, the American, Boston, Midwest, and Pacific exchanges were on the system. ITS uses CRT's to display the best bid and asked quotations on each exchange floor for a large number of publicly traded stocks.

Before executing transactions on their own floor, brokers check ITS to see if a better trade can be made on another stock exchange. If the ITS quotation is better than on their floor, they can input their orders into ITS to buy or sell on the specified exchange at the quoted price. The trader on the other exchange who "advertised" the bid or offer has up to 2 minutes to accept the order. Once the order is accepted, a transaction is completed and the result is reported back to the order originator via ITS. The net effect of ITS is a marked increase in arbitrage. Approximately 38 million shares are traded each month.

9. Securities Trading System of the Cincinnati Stock Exchange

The Securities Trading System is a more automated version of an electronic stock exchange than ITS. The system was developed by the Weedon Holding Corporation in 1975 and was implemented in October 1976. Control Data purchased the system (hardware and software) in 1979. The Securities Trading System is a nationwide stock exchange in which the computer replaces the trading floor. The functions of brokers, specialists, and market makers are performed via remote terminals in traders' offices. The terminals are connected to computers that receive buy-and-sell orders, match them for transactions, keep the specialists' books of bids and offers, and perform a myriad of recordkeeping functions.

With a computerized auction process, traders have more timely information for making transactions. Traders need only touch a few keys and watch their CRT's to check the status of their orders in various "limit order books." Public customers can wait on their phones while the brokers immediately check on a specific stock. If the customers request, the brokers can enter the bid or offer for an instantaneous execution.

The Securities Trading System started on a very small scale to test the feasibility of such a system. Today, 11 brokerage houses and specialists on four exchanges (Cincinnati,

Pacific, Midwest, and Boston) are participating. Trading is limited to 46 stock issues and daily volume is about 100,000 to 120,000 shares. The system operates on a price/time priority. At a particular price, the first bidder is the first served. However, public orders are moved ahead of professional market makers' orders at the same price. The average cost per transaction is about one cent per share.

If the system is widely accepted, it will revolutionize the securities trading industry. Principal buyers and sellers and their brokers will enjoy better information and lower transaction cost. Market makers will compete in a more competitive atmosphere. Much of the savings will be due to the ability to process a large volume of trades in an error-free and paperless environment.

10. Reuters' International Currency "Dealing" System

Reuters will be operating a computerized "dealing" system for foreign currencies beginning in January 1981. The system is an outgrowth of the news service's information system for currency traders. It will enable bankers around the world to trade currencies with each other through computer terminals. Initially, about 75 banks will be on the system.

Potential Uses of Electronic Trading in Agricultural Markets

Current electronic trading systems have led to consideration of the application of electronic trading to other commodities.

Grain

In many ways grains seem particularly well suited for electronic trading. Large numbers of traders are involved in the grain markets and large volumes of price and quantity data must be rapidly exchanged. Methods for describing grains are sufficiently well developed that they can be traded without the buyer observing the product. These descriptions are currently widely used in telephone trading. The grain industry already makes extensive use of electronic information systems such as those provided by commercial news services like Commodity News Service, Reuters, and American Quotations Systems.

Cotton has proved the agricultural product most successfully traded on electronic systems thus far. The resemblance between cotton and grain production and marketing encourages consideration of electronic trading of grain.

Both cotton and grain are adequately describable without the buyer having to observe the product. Both are annually produced, storable commodities with dispersed areas of production. The storable nature of these products affords an element of flexibility in trading. The dispersed nature of production has led to active telephone trading. Computerization provides traders simultaneous access to many opposite parties. It offers potential efficiencies in processing and transferring the large volumes of information that must be exchanged between buyers and sellers handling many different qualities of product.

In addition to offering grain buyers and sellers improved market information

and expanded access to other traders, a computerized system could provide various trading aids. Each trader could be given the opportunity to select the grades, delivery dates, and delivery locations of immediate interest and suppress information that is not needed. The computer could readily calculate differences between cash prices and futures prices to help traders price grains for local delivery relative to futures price quotations. The system could help traders adjust quotations for different locations and different delivery dates to take into account hauling and storage costs.

For example, the system might allow each trader to enter a set of locational price differentials reflecting the costs of hauling from the trader's elevator to several delivery points. Then any subsequent offer of grain for sale would automatically be converted into multiple offers, one at each of the selected delivery points, using the price differential previously established. This would aid the seller in exposing the grain to more buyers. Whenever the offer at any location resulted in a sale, all of the corresponding offers at other locations would be instantly withdrawn to avoid selling the same lot of grain more than once.

A computerized grain trading system might also provide for lining up or trading grain transportation services. Hauling services could be traded between carriers and grain firms much like the grain itself. Truckers could offer to haul specified quantities between given locations during designated future time intervals. Farmers, grain merchants, and processors could bid for the hauling services that they need. A great deal of information would have to be stored and processed about origins, destinations, quantities, time intervals, bids, offers, and other terms, but computers excel at this type of task.

Although there seem to be many possibilities for improving grain and oilseed marketing through electronic trading, no strong movement currently exists to develop such a system. Most market participants are reasonably satisfied with present pricing methods, and there is no firm evidence that these methods are seriously flawed.

Wool and Mohair

Like cotton and grain, wool and mohair are storable and thus well suited for electronic trading. Objective description, a primary requisite for a viable electronic system, exists for wool and mohair. The objective measurement of average fiber diameter, clean wool yield, and contamination is now possible. This provides the potential to scientifically measure characteristics which determine 85 to 90 percent of the value of a lot of wool or mohair. The remaining characteristics affecting the value of a lot -- color, fiber length, and tensile strength -- must still be assessed visually. Progress has been made in techniques for measuring length and strength, but a viable means for scientifically measuring color has not yet been developed. Also, particular to the description of mohair is the need to visually assess kemp content. This hollow fiber detracts from the end-use value of mohair because it is brittle and does not absorb dyes well.

Computer Sciences of Australia has designed a computerized trading system for wool, WOOLNET, which is being considered for implementation in

Australia. Interest in WOOLNET has been expressed by concerned parties in the United States.

Studies and Evaluations

Multiple Commodity Feasibility Study

The University of Georgia Experiment Station is currently conducting a feasibility study on the potential for a multiple commodity electronic marketing exchange. Part of the study will measure user acceptance of such a system. Physical dimensions and estimated costs of potential systems will also be calculated.

A representative sample of sellers of multiple commodities is being surveyed to determine their potential acceptance of selected electronic trading systems. Buyers for this study may include firms located anywhere in the United States. The area concerning sellers will encompass southwest Georgia. Findings should be readily transferable to a broader marketing perspective.

North Central Regional Research Group NC-117

North Central Regional Research Group NC-117 is sponsoring an evaluation of electronic marketing systems. The NC-117 is comprised of representatives from 18 universities, USDA, and the Federal Trade Commission. Its charge is to examine the organization, control, and performance of the U.S. food system. In executing this charge, NC-117 undertakes two major kinds of studies: (1) industrial organization type studies which examine the structure and performance of food industries; and (2) studies which focus on pricing and coordination in agricultural markets.

A task force on electronic marketing was established pursuant to the second objective. Its research agenda includes: (1) evaluation of the experimental electronic trading systems in U.S. agricultural markets; (2) examination of electronic exchanges in foreign agricultural markets; and (3) an overview of electronic trading systems in nonagricultural markets. The NC-117 task force will also provide the needed forum for an overall assessment of electronic marketing.

Problem Areas

Electronic marketing, like all new ideas, is not a panacea. Some traders may view the establishment of an electronic market as a threat to the old marketing system, which may be somewhat inefficient, but is nevertheless dependable and effective. Some of the concerns may be justified, like the possibility of a system failure, and some may simply be resistance to change. Some problems are short term and can be overcome with experience.

A key problem involves finding ways to assure buyers that the quality of product meets their needs. For some commodities, grades and standards are adequate for descriptive selling. In other cases, satisfactory information about product quality can only be revealed by identifying the seller.

Some traders have expressed concern about the impersonal nature of the electronic system, and that negotiations through a computer are not as flexible as voice communications or face-to-face contact. Many trade negotiations involve nonprice factors which are difficult to quantify such as reputation of the other trading partner, credit risks, normal terms of payment, and implied conditions of sale. Buyers and

sellers who regularly deal with each other may not have to negotiate all these nonprice factors on each trade in voice communications, but this is more difficult in an electronic setting where traders may not know each other.

A low per-unit cost is one of the advantages of an electronic system. But a high fixed cost for the base system can be a disadvantage in the early stages of development or when volume is not large. Thus, it is important to recruit a critical mass of traders to begin operation. Using a time-sharing system instead of buying computer hardware, can help to hold down costs.

Another problem in the short run has been trading volume too low to provide accurate prices and efficient operation. Volume must exceed some threshold level before gains exceed costs.

Summary and Conclusions

At the current time, the concept of electronic trading is appealing. It applies recent advances in computer technology to some important problems facing markets for many agricultural products. The technology to implement electronic marketing systems is readily available. The experience with TELCOT verifies that electronic markets are feasible and workable. Prospects for the test projects in Texas, Ohio, and Virginia are encouraging. On the other hand, the electronic marketing system for eggs is not widely used, and the system developed for trading wholesale meat awaits a sufficient number of traders.

There has not been a wide enough experience in the operation of electronic markets to know the formula for success. However, some elements seem essential. Product grades must be acceptable to the industry. The system must be cost-effective and reliable. The system requires substantial trading volume and must be compatible with existing industry institutions. It is essential that both buyers and sellers are involved in the development of the system to insure that it is compatible with their needs. And, there must be impediments in the present marketing system to generate impetus for change.

Several questions remain unanswered at this time. What are the costs and benefits of an electronic system, and to whom do they accrue? What will be the impact on various segments of the industry? What will be the impact on industry structure? What regulation is needed? Some of these questions will be answered in the next two years or as data are collected on the pilot projects currently underway.

Any of the six projects with which USDA is working may or may not prove viable. But, the experience to date shows that electronic markets can succeed. The technology is available. The economic theory is sound.

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